Digital Asset Management: How data can improve asset management

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Key Presentation Take-Aways

• Data is an asset for any transit business
• Digital replica using BIM and GIS
• Conditions monitoring and predictive maintenance practices improvement
• Data analytics to enhance value and performance of assets
Mobility Assets Under Pressure

• Increased mobility needs put existing assets under pressure

• Mobility assets are getting older and costs of maintenance are increasing

Photo: Time Magazine, NYC Subway 1969
Main challenges along asset life cycle

- **PLAN & INVEST**
  - ASSET OWNER / INVESTOR
  - Designer / Contractor
  - Operator / Maintainer
  - Make the right investment decision
  - Lower Life Cycle Cost

- **DESIGN & BUILD**
  - Develop and manage cost-effective mobility assets along their life cycle
  - Deliver mobility assets compliant with owner requirements & budget
  - Deliver mobility assets ready / easy for O&M
  - Mitigate Failure

- **OPERATE & MAINTAIN**
  - Deliver efficient and safe mobility services at the lowest O&M costs
  - Manage efficiently assets over their lifetime
  - Boost Performance
Asset Management at Operational and Decisional Levels

1. STRATEGY
- Due diligence
- Life Cycle Costs modelling
- Investment strategy
- Renewal strategy
- Maintenance strategy

2. SMART ASSET ENGINEERING
- Maintenance driven design
- Connected assets and remote condition monitoring
- Digital replica (GIS and/or BIM)

3. OPERATIONS & MAINTENANCE
- Maintenance readiness (rules, organization, process, document, training...)
- Maintenance continuous update
- Condition based maintenance

Make the right decision!
Get your asset O&M ready!
Boost your maintenance!

DATA ENGINEERING + CHANGE MANAGEMENT
Make the Right Decisions Early to Tune Your Asset Management Strategy

HOW TO PLAN THE RIGHT ASSET MANAGEMENT STRATEGY?

- Growing mobility needs require assets more and more performant (capacity, availability, reliability...)
- Growing mobility services accelerate assets degradation, gradually impacting O&M costs, performance and safety
- Budgets are more and more restricted (in terms of Capex and Opex)

LEVERAGE DATA TO INFORM YOUR DECISION MAKING

- To plan and draft cost-efficient and attractive mobility asset
- To simulate and compare design specification based on your asset management strategy using BIM
- Renewal / Maintenance decision support tool
Fit Your Renewal / Maintenance Strategy with Resource Constraints and Business Objectives

ASSET DUE DILIGENCE
- Asset management assessment
- Assets register and condition assessment
- Performance assessment (RAMS)
- Risks assessment

LIFECYCLE MODELING
- DEGRADATION MODEL
  - per type of asset
  - regarding assets use (train km...)
  - over the years

RENEWAL / MAINTENANCE SCENARIOS
- FIT FOR PURPOSE STRATEGY
  - OPEX target
  - PERFORMANCE requirement
  - RISK exposure
  - CAPEX constraints
  - RESOURCES constraints (works slots, equipment, staff...)

KNOW YOUR MOBILITY ASSET
SIMULATE ASSET DEGRADATION AND ITS IMPACTS ON RAMS AND COSTS
DEFINE, SIMULATE AND COMPARE RENEWAL/MAINTENANCE SCENARIOS
Fit Your Renewal / Maintenance Strategy with Resource Constraints and Business Objectives

- Assess asset condition
- Simulate asset degradation
- Compare asset management strategy
Get Assets Ready for O&M from Design and Construction Phases

HOW TO GET ASSETS READY FOR O&M?

- Contractors (delivery of assets) and operators (management of assets) don’t have the same business objectives
- Handover of asset information from contractors to the operator takes place late in the process and is very time-consuming

LEVERAGE SMART & COLLABORATIVE DESIGN WITH

- Maintenance driven design
- Digital replica (GIS and/or BIM)
- Connected assets and remote condition monitoring
Get Physical Assets Ready for O&M with Maintenance-Driven Design

MAINTENANCE DRIVEN DESIGN OF A BRIDGE EASY TO INSPECT

- A monitoring system able to inspect bridge along adjacent track still in operation at 320 km/h
- Maintenance requirement was specified at early stage
Get Digital Assets Ready Structuring Data with a GIS or BIM Model
Get Digital Assets Ready Structuring Data with a GIS or BIM Model

BUSINESS CASE – EOLE PROJECT

40 miles
0.6 Mpax
4 Bn$
Get Digital Assets Ready Structuring Data with a GIS or BIM Model

- Specify assets identification, classification and attributes serving O&M
- Prepare BIM & deliver identified and classified digital assets
- Fill asset attributes in the digital replica
- Deliver identified and classified physical assets
- Check and hand over asset information

Collaborative Digital Replica to Manage Asset Information
Get Digital Assets Ready Structuring Data with a GIS or BIM Model

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<td>Track</td>
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ASSETS CLASSIFICATION SERVING MAINTENANCE USE
Get Assets Ready for O&M with Remote Condition Monitoring

- Asset condition monitoring is not about big data but relevant maintenance information
- Start valuing existing data before collecting more!
- (If required) Specify fit for purpose monitoring system so as to collect few but relevant data to turn into valuable information for maintenance
Get Assets Ready for O&M with Remote Condition Monitoring

**DIAGNOSTIC**
1. Asset condition assessment
2. Asset performance audit (RAM)
3. Service performance audit
4. Maintenance organization audit
5. Available data assessment

**USER REQUIREMENT**
1. OPEX / CAPEX objectives
2. Performance requirement
3. Risks exposure (safety...)

**CAN YOU MONITOR ASSET CONDITION?**
- **YES**
- **NO**

**CONNECTED ASSET ENGINEERING**
1. Mapping of relevant condition monitoring solutions
2. Specification / design of monitoring system
3. Monitoring System implementation and T&C

**CHANGE MANAGEMENT**
1. Data engineering to turn data into maintenance information
2. Standards and rules change (condition based maintenance)
3. Maintenance organization change (process, documents...)
4. Training

**REVIEWING MECHANISM**
Condition-Based Asset Monitoring for a cost Efficient Maintenance Regime

- **DATA IMPACT**
  - CORRECTIVE
  - SYSTEMATIC
  - CONDITION BASED

- **MAINTENANCE COSTS**
  - Medium
  - Lower

- **AVAILABILITY**
  - Lowest
  - High

- **FAILURE RISKS**
  - High
  - Low

- When asset fails
- Every day
- Upon condition monitored
Digital Replica Concept

- Safety
- Asset Performance
- Quality
- OPEX CAPEX Improvement

- Design
- Build
- Maintain

- Mobility
- Legacy Systems and IOT
- Measurement machines, Sensors on board
- Drones, satellites
- Asset use and conditions
- Environment
- BIM
- Performance
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